OXFORD STUDY GROUP

ON CHILD NEUROLOGY AND CEREBRAL PALSY

St. Edmund Hall, Oxford

September 21 to 27, 1958

A REPORT BY DR. MARY CAPES

THE OBJECT of the National Spastics Society in sponsoring this meeting was to bring together experts who could pool their knowledge and might thereby clarify some of the many outstanding problems of cerebral palsy.

Could new light be thrown on the causes of abnormal development of the central nervous system? What were the factors in brain and muscle functioning which contributed to the lesions found in cerebral palsy? Could any new diagnostic tools be fashioned? What was actually meant by the terms in common use in discussing this disability?

In the past, when scientific knowledge was more limited, each worker could relate his own particular field of study to the whole, which he himself was able to encompass. Today this is no longer possible, specialisation forcing men to work in watertight compartments. Awareness of this led the sponsors to invite a multi-disciplinary group of people from South Africa, Sweden (7), Norway, France (4), Italy (2), Denmark (2), Holland and the United Kingdom to meet in Oxford for a week. Preparatory work began in 1956, and, through the careful planning and coordination of Dr. Mac Keith, 54 participants finally assembled in Oxford, already involved and keenly prepared to contribute to the common aim. In the group were seven neurologists, three physiologists, three experts in EEG, an anatomist, two biochemists, three psychiatrists, two psychologists, two orthopædic surgeons, a specialist in physical medicine, a speech pathologist, an expert in nutrition, two research workers on cerebral palsy, a specialist in public health, and twenty-five pædiatricians.

Conduct of the Meeting

All meetings were held in plenary session, except for two smaller discussion groups who foregathered in the evenings. These and the film sessions provoked the liveliest exchange of views, but because of the tightness of the programme it was impossible to follow up the papers with adequate discussion. Nevertheless, since this was a lively and productive meeting, valuable informal conversations continued over the dinner-table, over drinks, and into the early hours of the morning, fostered by the sympathetic environment of St. Edmund Hall and the high level of hospitality. A clinical case demonstration provoked a spirited discussion, whilst the whole programme was rounded off effectively on the last afternoon with summaries from the recorders of each session.

Content

The major subjects which the study group considered were:—

(1) The anatomy, biochemistry and enzymology of the developing nervous system.
(2) Neurological examinations in the first year of life.
(3) Hypertonus.
(4) The terminology and classification of cerebral palsy.

Papers were read on other topics, which included the value of the electroencephæogram and specific disorders of mentation, and it was evident that the recent dram-

atic discoveries in these fields needed to be integrated with the whole. Many of these papers will be published in this or other journals, since no extracts can do them justice, but some indication of the more immediate and practical issues may be mentioned here.

The Neurological Development of the Child from Birth to One Year

This subject was introduced with an outstanding French film made by Mme St. Anne Dargassies, in which she demonstrated the diffusion of responses of the premature infant and compared these with the responses at full term. The film was based on the work of Prof. André Thomas, whose method of examination of the newborn was then described in detail. Muscle tone, reflexes and reactions were the factors to be assessed, and though the result of the neurological examination depended on any pathological state it was also influenced by physiological states at the time, such as sleep, hunger, contentment, etc. Alterations elicited during the examination taken in isolation could not be said to have a consistently pathological significance, but certain changes, particularly if asymmetrical, persistent or multiple, were in all probability abnormal. Prognosis should, moreover, never be based on the inferences drawn from the neurological examination without taking careful note of the history.

Finally, an excellent and beautiful demonstration of André Thomas's technique was given showing the applications of this valuable diagnostic tool. It was suggested that a somewhat similar film to the French one, for exhibition in the United Kingdom, would be invaluable not only to introduce the methods of the French school but also to emphasise the differences in the neurological examination of the adult and the developing child.

Hypertonus

Another topic to which considerable time was devoted was the neurological mechanism involved in the stretch reflex, and its use in differentiating between rigidity, spasticity and dystonia. It was appreciated that only from a detailed study of the meaning of these irregularities of tone, and of the changing postures, would an accurate diagnosis be made to render the rehabilitation programme truly effective.

In this connection the Study Group felt that an important step forward might result from a close association of a few experts in physical medicine and physiotherapists, with pædiatricians well versed in child development and neuro-physiologists. Well-established empirical methods could then be discussed in the light of recent researches into neuromuscular functioning. The therapeutic possibilities of (drug) interference with the gamma motor fibres, their motoneurones, or their connections within the brain or spinal cord also called for investigation. (See *Cerebral Palsy Bulletin*, No. 3).

Value of the Electroencephalogram and Electromyographic Observations

It was remarkable to learn that EEG tracings had been made of a fœtus aged only 4½ months, and it was interesting that the tracings of the premature and newborn followed closely the stages of neurological maturation. On the other hand, the lack of any clear and constant correlation between the EEG findings and the main clinical features of cerebral palsy, as in other lesions, was remarked, except in hemiparesis, where it was very close. Valuable data, however, which would otherwise be missed, was obtained through repeated EEG examinations at 6-12 monthly intervals.

Considerable discussion centred round the advisability of giving anticonvulsant drugs when the tracings showed an epileptiform pattern without manifest convulsions. The risks of side-effects, and the difficulty of explaining the need for treatment to the parents, influenced the

majority against this practice. Standardisation of the technique of examination had still to be attained before the results of different centres could be compared. The use of recording instruments for the measurement of muscle power and muscle resistance to stretch was another advance towards assessing progress in therapy, and there was an obvious value in having a permanent record for comparison.

Terminology and Classification of Cerebral Palsy

Perhaps the most lively discussions of all centred round this topic. It became very obvious at the clinical meeting at the Radcliffe Hospital that opinions were almost unanimous in regard to clinical signs but far from unanimous in regard to the meaning of the precise descriptive terms. This was emphasised by the variation in the technique of examination used by neurologists, on the one hand, and pædiatricians and orthopædic surgeons on the other.

Continuing discussion during the week underlined that most of the terms in common use in cerebral palsy were borrowed from current neurological terminology and designed for the description of conditions affecting the adult, so they were often inapplicable to children. Furthermore, the terms were used by neurologists to describe brain function, while specialists in physical medicine and orthopædic surgeons were using them in a different sense to indicate whether a given lesion was likely to respond to treatment. There was evidently a need for a glossary of the terms in common use, to be scrutinised by neurologists when pædiatricians, orthopædic surgeons and specialists in physical medicine had together hammered out what they wanted to define.

The classification of the American Academy for Cerebral Palsy (1956), and the more recent publication of the Little Club, both met with a certain amount of critcism. A plea was made for the avoidance of any classification which would be restrictive, since the awareness of differential signs and diagnostic skills was developing rapidly. And classification based on the disorganisation of movement control, producing spasticity, athetosis or ataxia, was thought more desirable than one based on muscle tone. A provisional definition of cerebral palsy which received general if not unanimous approval from the Group finally read as follows:

> A non-progressive condition affecting those parts of the brain which control movement and posture, acquired in the course of early brain development.

Specific Disorders of Mentation

These were defined as those specific difficulties of learning, of number work, reading, writing or speech, which occurred in a child whose general level of intelligence and motor ability was not comparably impaired. But the extent of the problem in children with cerebral palsy, and other diseases affecting motor and sensory development, as well as in normal children, still needed investigation. Such a comprehensive enquiry as was necessary should include not only a study of motor, sensory and perceptual abilities, but also of the child's drive or motivation, the attitude of his parents, and the nature of the environment in which he was developing. Disturbances of body image, defined as a constant state of awareness of the position of the body, or alternatively as that which makes it possible for appropriate bodily movements to be performed in relation to different stimuli, also needed further investigation. Already some centres, in particular the one for *"Aide aux Enfants Paralysés"*, in Paris*, have worked out a battery of lists and exercises for therapeutic training in building up a store of knowledge about the body, and this work could be extended.

*See Mme. Stella Albitreccia's paper from this famous polio centre in this issue.—ED. *C.P.B.*

Tests, devised by various specialists to determine disordered space and shape perception, though recognised as not fully comprehensive, were welcomed.

Evaluation

In assessing the results of any conference it is necessary to ask whether the aims of the sponsors were fulfilled, what are the immediate gains to the participants, and what new studies are likely to emerge.

That this conference was an outstanding success was a tribute to the National Spastics Society, which by its pioneering effort in this country brought together groups of experts who freely exchanged information and experience under ideal conditions. From the discussions, papers and films members gained new knowledge and appreciation of advances in fields other than their own, and they will return to their work with fresh vision and inspiration. Methods of prevention, early diagnosis, and treatment will be reassessed not only in regard to cerebral palsy but in associated problems. Underlying all this, the emphasis placed on the total needs of the individual will be remembered, and a fuller appreciation gained of the importance of the mother-child relationship.

What of the Future?

It was agreed that preventive measures are still inadequate, and that the causes of prematurity, and the effects of severe neonatal jaundice, remain obscure. There was a general feeling that the mother/fœtus relationship should be put into the forefront of research, and that too little is known about the physiology and pathology of the placenta. How could the recent advances in the study of nutrition be applied during pregnancy and in the early months of life? These were the subjects that seemed to call for priority in research.

Of immediate application is the wider dissemination of knowledge which would be gained through films demonstrating the evolutionary process in the normal and brain damaged infant, and from a yet closer study of nomenclature.

Another conference of this kind in two or three years time, to assess progress, would receive enthusiastic support.

This report would not be complete without a warm tribute to Dr. Ronald Mac Keith for his imaginative and constructive organisation of the meeting, combined with the constant helpfulness and happy efficiency of Miss Alexander, Miss Albrow and Mrs. Kelly.

DISCUSSION ON BODY IMAGE

IN THE discussion of the papers on body image, three of which are published in this issue, it was pointed out that agnosias resulting from inadequate practice or experience should be distinguished from those resulting from specific cortical lesions (chiefly parietal). The former can be expected to improve under special educational treatment more readily than the latter. Then it is necessary to know the "gnosic age" of the child in order to avoid expecting improvement which is impossible for him to achieve. It is clear that we need to know more about the development of gnosias.

The diagnosis of astereognosis is often made by testing only the ability to appreciate the shape of an object in the hand. Other signs of defects of discrimination which do not involve the ability to manipulate should also be investigated, such as lack of position sense, or two-point discrimination. In interpreting children's drawings, social and emotional factors and also the child's motor control must be taken into account.

The term "body image" seems to be used to cover different phenomena.

WHAT THE PARTICIPANTS SAID

The following extracts come from the many "thank-you" letters received by the organisers from members of the Oxford Study Group.

Obviously a great success.

Exactly the right mixture of age and youth . . . as a long-term investment, I think it is probably one of the wisest things the Society has done.

. . . all went off beautifully, including a fuse or two, which added a nice informal touch and brought relaxation.

Il faudra que je me procure des petits vases à boutonnière pour les membres de nos seminaires.—*France.*

We learnt a lot, we learnt to know each other, and the conference really contributed to our main purpose—to know more and to do more.—*Denmark.*

[One would have thought that] there could not possibly be so many individualists as amongst the 50-odd who were gathered together at St. Edmund's.—*S. Africa.*

I must tell you how much the meeting in Oxford interested and stimulated me. I really enjoyed it as much for the professional point of view as for the warm and welcoming atmosphere I met there and found so delightful.—*France.*

I have never attended a more successful meeting, and I am not saying that because of the excellence of the food and wines, which through the generosity of the N.S.S. took care of the inner man in a way quite comparable with the mental feast provided by the lecturers.

Everyone seemed to enjoy themselves.—*Sweden.*

My warmest thanks for a marvellous week in Oxford. All of us were a good deal richer in knowledge and experience after all these discussions with kind colleagues.—*Sweden.*

I found the whole week most stimulating, in particular the informal atmosphere.

I don't know enough of superlatives in the English language to express my gratitude. It has been a most marvellous week in Oxford. First the contenance of the meeting, the opportunity to meet colleagues, the discussions, and the charming personnel which surrounded you. I would like to express my gratitude to the National Spastics Society.—*Sweden.*

Various highlights stand out, particularly to me the contribution of the French contingent.

I would like to congratulate you with the results.—*Norway.*

This is the first meeting of that kind at which there has been such a good atmosphere of friendly and simple discussions—together with informality and gaiety . . . and also I have found that the European Western World has really something in common . . . a certain way of thinking.—*France.*

We who are engaged in child neurology lack opportunities to exchange our knowledge, and it became a great inspiration to me to meet so many nice people from various countries working on the problems of cerebral palsy and child neurology. You and Paul deserve the greatest compliment for your initiative. I certainly hope that similar conferences may be a reality in the future, replacing some of the huge international congresses where you wait your time and get your soul split up because you cannot make up your mind which section to follow.—*Denmark.*

. . . l'agréable et instructif séjour. . . .—*France.*

Our mutual happiness for the success of the symposium in Oxford.—*Czechoslovakia.*

It was a real conference with, at least for us Scandinavians, the right English atmosphere that we like to inhale. One has to be glad nowadays when one realises there are things that are national and can't be imitated in other countries.—*Sweden.*

Tout y a concurru à notre enchantement: cet admirable Oxford, la vie de collège retrouvée, et surtout la gentillesse de tous. Nous avons vraiment bien travaillé, et dans une atmosphere d'amitié incomparable. Je serais heureux que vous transmettez aussi l'expression de notre reconnaissance à le National Spastics Society.—*France.*

The most refreshing conference I have ever attended.

Thank you for the pleasant stayment in Oxford. I really hope these meetings shall continue.—*Denmark.*

It was not boring at all.

THE STUDY GROUP IN THE COLLEGE HALL

Top Row: D. Richter, T. T. S. Ingram, P. H. Fiedeldij Dop, K. A. Melin, S. Brandt, I. Olow, R. S. Illingworth, D. MacCarthy, R. V. Saunders, J. P. M. Tizard, J. E. Collins, E. Ellis, M. d'Avignon, Bo. S. V. Bille.
Second Row: C. G. Phillips, J. D. Kershaw, J. A. V. Bates, I. Mackenzie, P. Masse, J. N. Cumings, A. Lundervold, G. Rushworth, T. Mann, B. Epstein, N. S. Alcock, W. Dunham, A. Minkowski, P. Plum, B. S. Platt, C. Koupernik.
Third Row: Mme. S. A. Albitreccia, J. D. Boyd, G. Pampiglione, Mrs. Melin, G. Pollock, Mme. A. Grisoni Colli, Mme. Y. Cizkova, Mrs. Venn and Robin, Mrs. Johnson Abercombie, Dr. Mary Capes, Dr. Alison McDonald, Dr. Grace Woods, Dr. Elsa-Brita Nordlund, Mrs. Milani, A. C. Milani.
Fourth Row: B. Hagberg, Mrs. E. Kelly, Miss E. Albrow, Dr. Elizabeth Martin, P. E. Polani, G. Tardieu, Mrs. Beaman, E. Hansen, Mme. Tardieu, Miss B. Alexander, R. C. Mac Keith.
Attended but not in photograph: Dr. Bjoersson, E. A. Carmichael, B. Karlsson, H. Ellis, J. Foley, P. B. C. Matthews, W. Ritchie Russell, R. G. Willison.

DISTURBANCE OF THE BODY IMAGE

W. RITCHIE RUSSELL, C.B.E., M.D., D.Sc., F.R.C.P.
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THE FUNCTIONS of the human brain cannot develop unless most of the main afferent pathways are intact. Those concerned with the so-called body image system are the sensory pathways which project on the posterior half of the cerebral hemisphere, especially to the post-central gyrus and the calcarine cortex. The development of the body image system in infancy probably depends on an elaborate system of chance. Thus the infant sooner or later finds how to put his fist in his mouth, and, as this produces an agreeable sensation (through the lips), the sensori-motor reaction is facilitated, repeated and strengthened so that bringing the hand to the mouth is one of the most strongly developed bodily reactions. Later the eyes learn to turn towards an object seen and the hand learns to move towards it, grasp it, and convey it to the mouth.

These are the first steps in training a very elaborate system which in clinical work are found to break down in a number of different ways.

Body image is not really a very good term because it lays undue emphasis on the visual aspect, and of course people who are blind from birth can preserve or form a very delicate body image system.

I would suggest as a definition that the body image system is that which makes it possible for appropriate bodily movements to be performed in relation to afferent stimuli. Further, the all-important afferent components of these movements must play an essential part in both the development and maintenance of the system. Thus a prick on a finger; a visual afferent such as, say, a stone coming towards you; an auditory stimulus such as a motor horn; or a taste or smell, will, in the intact adult, lead to an appropriate motor reaction for which an intact body image system is absolutely essential.

It is not surprising therefore that these laboriously developed mechanisms formulate themselves in the part of the brain that lies *between* the main receiving areas of cortex—in the parietal lobe—and it is with lesions here that the tract communications between the parietal and occipital lobes are interrupted, and that the most striking body image disorders are observed.

In the healthy brain the mechanisms involving the limbs develop largely in the contralateral hemisphere, so that, in the previously healthy adult, lesions of the parietal lobe lead to gross and permanent defects in the contralateral limbs. Thus it is common to observe loss of awareness of the position of contralateral limbs, inability to localise objects touching the contralateral limbs or seen in contralateral fields of vision, and also a lack of attention to objects touching the contralateral limbs or seen in the contralateral visual fields. In the adult these lesions cause a severe permanent deficit, but in the untrained brain of the infant the position is very different. It has become apparent that when infantile hemiplegia comes on before the child is 18 months of age there is a considerable capacity for one hemisphere to develop some control of the limbs on the same side as the brain damage, so much so that severe degrees of hemi-loss of body image are not observed in cases of hemiplegia of many years' duration which developed in infancy. In these cases the intact hemisphere proves to be more trainable as regards the homolateral limbs and compared with what remains of the

W. Ritchie Russell, R. G. Willison.

damaged hemisphere. This I think accounts for the various observations on cases of hemispherectomy in which, for example, removal of a hemisphere partly destroyed by disease leads to little change in the neurological deficit.

Phantoms

In this short contribution I can only touch on a few aspects of the body image problems. For example it is worth noting that focal fits beginning in the parietal lobe may produce phantom sensations of false localisation of the position of contralateral limbs. From the physiological point of view this situation seems to be very comparable to the visual hallucinations which occur in fits originating in the occipital lobe. Both stimulate falsely a sensory system at a rather crude level of its organisation. We have also observed focal attacks originating in a parietal lobe which cause temporary agnosia of the opposite limbs, presumably an inhibitory phenomenon comparable to the transient hemianopia which may occur in visual fits.

One special aspect of the body image mechanism to which I should like to refer is the phantom sensations occurring in amputees. If the end of a nerve in an amputation stump is stimulated it is entirely to be expected that the sensation or pain caused should be interpreted by the well-trained parietal lobe as coming from the missing limb, but if a child loses a limb in the first 18 months of life no phantom sensations will persist. In the adult, phantom limb sensations after amputation will usually disappear within a year, but if there are sensitive neuromata or scars the various sensations or pains continue to be referred to the phantom hand or foot.

This is all to be expected in view of the life-long training to which our parietal lobes are subjected. The structural changes in the synaptic systems which result from this training are probably very substantial —like those which must maintain some memories of early childhood—and this becomes apparent in the elderly amputee who develops a painful condition in a stump or its nerves perhaps 30 years after amputation. This may re-awaken phantom sensations which had not been experienced for 30 years, the parietal lobe having maintained the consequences of the training it received in the earliest years of life.

It is not necessary for the limb to be actually lost for phantom sensations to appear. A de-afferented limb behaves in exactly the same way, as is seen in cases of complete tear of the brachial plexus.

Loss of Body Image

Loss of body image of one side of the body or of one limb can be well compensated for if the thinking areas of the brain are not severely damaged, but when bilateral lesions occur the situation may be very different; loss of body image may then be so severe that the victim cannot establish his spatial relationship with external objects. Thus he may become unable to sit on a chair or get himself into bed. In the visual sphere he may be spatially disorientated and unable to find his way, and may lose his capacity to recognise his surroundings or his friends.

Loss of body image in the adult therefore means the loss of something which has been laboriously acquired throughout life. One is apt to think of this as a high level of cerebral organisation but in fact we are studying a low level of sensori-motor organisation which is essential for the proper working of even the slightest sensori-motor activity. In man this system is organised in such a way that the parietal lobes form an essential region in that the fibre pathways through this lobe are vitally concerned with the organisation.

Finally, from the point of view of children with cerebral palsy, I am indebted to Dr. R. G. Willison for criticising this short paper, and also for the important

suggestion that a defect of motor control may lead to faulty development of the body image through faulty afferents from the movements made. This would lead to a vicious cycle, which may occur in children who develop athetosis. It is probably significant that the sensori-motor chaos observed in athetotics never develops in an adult brain damaged by injury or disease.

This raises the challenging possibility that, though athetosis cannot be cured, it could to some extent be prevented by suitable physical training with assisted movements if these were given adequately, before the abnormal movements become fully developed.

SUMMARY

The physiological mechanisms concerned with the development of body image are destroyed in disease of the parietal lobes of the brain.

A study of phantom limbs in amputees contributes to knowledge of the subject.

Severe athetosis never develops in adults—in a trained brain. In infants with brain damage the movements may possibly be encouraged by faulty information reaching the brain body-image mechanism. This possibility may be important in regard to the principles of treating athetosis.

THE DEVELOPMENT OF BODY IMAGE

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THIS IS a subject on which we have done no special research but have been aware of its importance in connection with cerebral palsied children for several years. This interest has been greatly stimulated by a visit that Miss Ram, headmistress Bristol School for Spastics, and I paid to Madame Albitreccia's clinic in Paris in 1955.

By the body image, we mean a constant state of awareness of the position of the body, and it is fundamental to normal development and behaviour.

Possibly the child develops an unconscious awareness of the body image at a very early age. In the first few months of life the child's movements are controlled by primitive reflexes such as the sucking reflex, the tonic neck reflex, and the righting reflexes. When this period of reflex motor behaviour is substituted for more voluntary controlled intentional behaviour, the child must have developed an awareness of a body image. This must occur when the child deliberately blows bubbles, puts objects into its mouth, and starts to play with his hands. McGraw suggests that this unconscious sense of appreciation of the body is shown when the child uses his lower limbs for crawling and can accurately push off with his feet without seeing them. Presumably a child must have a safe and confident sense of the position of the body in space as soon as he starts to walk.

In studying the development of body image, one naturally studies the children with varying defects to assess the various factors that influence this development.

(1) *Intelligence.* In a mental deficiency hospital, I have been interested to note how a child of even imbecile level of intelligence may have an accurate idea of his body. Some children who turn out to be of low intelligence and never understand more than simple commands, and who develop little

speech, walk at about the normal age (11-16 month), some of them in a co-ordinated neat manner.

I was watching a little girl of 2½ years who had never understood what was said to her and tended to treat people as pieces of furniture. When her mother was dressing her with a frock she bent her shoulders and put up her arms in a neat cooperative manner for dressing. Whatever her handicap, she had an accurate sense of body image. The mother of a brain-injured boy of 5 also had a Mongol child of 2. She complained that the boy had no idea of where to put his cap, whereas the Mongol accurately placed his cap on his head. On the other hand, complete idiots appear to have no idea of their body and will easily bruise themselves against any protruding knob.

(2) *Vision.* It has been shown by Norris *et. al.* (1959), and I have myself observed, that an intelligent blind child will crawl at only a slightly later age than normal, but walking is delayed. Possibly lack of a visual concept of one's own body and of the world around does delay the development of body image. Gesell states: "The blind child . . . as an infant has more difficulty than the seeing child in attaining a perception of his physical self. His physical self is ambiguously involved with garments and with blankets and with furniture. He has not the assistance of sight to make the fundamental distinction between his anatomical self and all these appurtenances.

(3) *Hearing.* Hearing is also possibly an important factor in coordinating oneself and one's environment.

(4) *Sensation.* Crudely one can divide these into accurate epicritic sensations from the nerve endings in the skin, particularly of the hands, and the proprioceptive impulses reaching the brain from the muscles and joints and vestibular apparatus.

In watching our cerebral palsied children we have felt that some children with quite definite astereognosis, particularly the hemiplegics, have no loss of body image and will automatically use the defective hand for simple tasks and will hold the arm in a position suggesting an awareness of the limb. One child with bilaterial astereognosis, we feel, has no real loss of body image, and this is borne out by his learning abilities. He is for instance good at arithmetic and can write. In other children a loss of sense of position appears to be related to a defective body image. It is difficult to make any judgments from the testing of two-point discrimination in a child.

Another interesting point has been raised by Macdonald Critchley in discussing the body image in adults. He suggests that when driving a car the car may become part of one's body image. In the same way, one's clothes can be incorporated in oneself. We have an interesting intelligent child with spina bifida and completely flaccid and senseless legs. In crawling through doorways he never hits his legs—although useless, they are part of his body image.

(5) *Movements.* Possibly an important factor in the development of a body image is the impulses that reach the brain from the muscles and joints and the vestibular apparatus, and it is only with movements that an accurate sense of body image can be obtained. This may explain the difficulty in poliomyelitis cases mentioned by Madame Albitreccia, which was also noticed independently by Miss Ram among ill children who had been immobile from early childhood.

We have been interested to find that the athetoids who have movement, even if abnormal, have not this defect in the same way as spastics. One of our little spastic children appears to know the position of her knees but not her ankle or hip-joints. She is a child who gets around by crawling and one wonders if this can be an explanation.

At our Bristol school we are becoming conscious that these spastic children need all the movement and freedom of movement they can get. They need to experiment with sand, water, etc. at a very early age. They must crawl and roll whenever possible, and should learn to feel their own bodies and the bodies of other people. They should learn to dress and undress and the physiotherapist can help by making the child conscious of all his movements. We feel that many of our children have benefited considerably by this movement and this is one of the reasons why admission at as early an age as 3 years is beneficial.

When the knowledge of one's body is incomplete, all actions for which this particular knowledge is necessary will be faulty. This includes the early movements of childhood and also the later skills of education such as writing and arithmetic.

Possibly in the early months of life one can talk about an unconscious sense of body image. In later childhood one reaches a conscious sense of body image which is at the learning or symbolic level. At this stage the child may show some of the difficulties noted in adults by Macdonald Critchley. They have difficulty in telling right from left. First on themselves and then on others. In a normal child this is usually reached by 9 years of age. They may show difficulties in recognising their fingers; —a skill which should be reached by 9 years.

Whereas a normal child can recognise pictures at 18 months old or younger, a handicapped child may not reach this skill till a much later age, may be because of an absence of a concept of himself in space. As Madame Albitreccia has shown, manikins and drawings may reveal a symbolic defect in the child's body image.

Lastly, in discussing the question of defect of development of body image, the question arises where the defect lies. Possibly in some cases it is purely an environmental defect due to lack of movement, as in bedridden people and some cerebral palsy cases. In many of our cases the defect may be due to damage in the parietal lobes. Macdonald Critchley and others have placed the lesion in adult cases in the minor hemisphere. Interestingly, a piece of research done by Mr. Wedell in Bristol has shown greater body image defects in left hemiplegia than in right hemiplegia of comparable intelligence. Possibly occipital-lobe damage upsets the development of body image.

Obviously a large number of sense perceptions are necessary for an accurate idea of body image, but there is evidence that if a child has a defect of one of these sensory pathways, it can often, so to speak, "find a way round". Given adequate sensory and movement experience, many children will learn by the almost unconscious use of another special sense to overcome their difficulty, and with intelligent children who have defects of body image it is worth persevering to help them overcome their handicap.

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RECOGNITION AND TREATMENT OF DISTURBANCES OF THE BODY IMAGE*

by

MME. STELLA I. ALBITRECCIA

Speech Pathologist at the Poliomyelitis Centre, "Aide aux Enfants Paralysés", Paris.

I PROPOSE to put before you the outcome of our researches on disturbances of the body image, which we have observed in a large number of children suffering from motor disorders from an early age. In studying these disturbances, applying appropriate tests, and elaborating the relevant group of exercises, our purpose has been to define the correlation which exists between disturbances of the body image and the numerous physical and scholastic problems often encountered in children with cortical disorders when they are called upon to make an effort demanding exact localisation, coordination and pattern integration, whether in the motor field or in the field of speech and writing.

In the course of this research we have observed that children contracting polio at an early age sometimes present disturbances of the body image similar to those commonly found in children with cerebral palsy. These observations have led us to realise that these children have a poor knowledge of their own bodies, which shows itself in an inability to copy the position of different body segments and a tendency for the muscles of a limb to act as a whole and not in groups. Orientation in space is equally affected in various degrees.

A Battery of Tests

We have made a battery of tests which allows us to demonstrate the different praxic and gnostic disturbances, as well as disturbance in orientation, in laterality, and in recognition of the human figure. We have added to these tests some exercises allowing us also to study rhythm and mimicry in the same patients.

For the examination of orientation and right/left laterality we have used Piaget's test. The child is asked to kiss his right or left hand or to take an object with either hand. Next the child is asked to point to the examiner's right or left hand. One may also place three different objects in front of the child, and then ask him to touch or move the object on the right or left side of the central one.

We applied Head's test for loss of orientation in space in connection with one's own body, because dyskinesia is often present. This test consists of three parts. The first part is done to command. The child is asked to touch some part of his face with a specified hand—for example, to touch his forehead with his right hand or to touch his right knee with his left hand. In the second part one explains to the child that he is to imitate his examiner—for instance, to touch his own eye, ear or mouth with either his right or left hand, just as the examiner does. We often find that the child copies this in reverse, as in a mirror image, using the hand on the same side as the examiner's rather than his own right or left. In the third part the child is asked to copy a movement from a simple diagram. A drawing is placed in front of him and he is asked to do what the man in the picture is doing; this is the most difficult task.

*Read at the N.S.S. International Study Group on Child Neurology and Cerebral Palsy, Oxford 1958.

For studying gnosias* we have used Rey's tests, so far as they deal with segmental attitudes and synkinesias.

Rey's test for control of finger movement consists of two parts:

(1) *Single Finger Movement.*—This tests finger movements which require an effort of dissociation.

(2) *Simultaneous Finger Movement.*—This requires an effort of coordination as well as of dissociation. It tests the voluntary, finely localised, movements of the fingers.

Success in this test depends on the capacity to inhibit synergic movements. One starts with the right hand. The fingers are moved in the following order:

1 3
2 4
3 5
1 4
2 5

The thumb is the most independent digit; then come the index finger, middle finger and little finger. The ring finger shows most synkinesis. Rey studied the finger which moves synkinetically. The ring finger provokes synkinesis in the middle finger more often than in the little finger. Synkinesis may occur in the homolateral or in the contralateral hand. With normal children synkinesis in the contralateral hand is rare. But movement of the thumb may provoke synkinetic movement of the thumb of the contralateral hand.

Conclusion.—Most children achieve independent finger movements by the age of 9 years; 40% of children show difficulty in independent movement of the ring and little finger up to the age of 14 years. Children with a defect of motor control may carry out single finger movement well for their age, but they may fail when asked to move two fingers at a time.

Single finger movement tests for finely localised voluntary control combined with the power of inhibition of synkinesis. Simultaneous finger movement tests the capacity for coordinated movements in combination with inhibition of synkinesis.

For finger testing we have chosen Gerstman's test for digital agnosia. Digital agnosia is characterised by difficulty in distinguishing one's fingers when they are touched, and in showing, naming and choosing individual fingers, either one's own or the examiner's. The patient also finds some difficulty in moving a specified finger. He makes mistakes and is confused even when his eyes are open. He is often incapable of recognising which finger the examiner touches.

Gerstman standardised his test on adults. We are the first to have studied its use in children who show right/left confusion, acalculia, and agraphia without alexia. Patients with digital agnosia often have a bad score in the Goodenough test, especially in drawing the face and hands. Agraphia appears mostly in inability to copy and in mirror writing. This agraphia is usually accompanied by major difficulties in constructive activity. In applying the test we put a drawing of the hand to be tested in front of the child. His own hand is then put on the table and covered with a special box. First individual fingers of the hidden hand are touched and the child is asked to indicate on the drawing in front of him which finger has been touched. This is done first with one finger at a time, then with two in succession, and then with two fingers simultaneously.

There is often difficulty in distinguishing the index from the ring finger. Often it seems as though the patient's hand is divided by a median axis running through the middle finger and that the sensations in the ring and index fingers are reversed. It is, however, very rare for the patient to confuse the thumb and little finger, and if he does, then one finds important orientation and spatial structural difficulties.

For the examination of praxis, since we often work with very young subjects, we have chosen simple exercises familiar to children, such as following the parting of the hair with the finger, showing the ribbon or slide in the hair, or showing where the buttons are on the clothing. For the recognition of the human figure we have used Binet's omission tests, and

*Details of norms of finger gnosia in children, and of right-left discrimination, are quoted by R. C. Mac Keith in the paper, "A Paediatrician's Screening Tests for Speech Disorders of Mentation", read at Oxford and to be published in this *Bulletin*.

exercises done by the child on himself and those around him. By using this "surface" or "tactile" approach a localisation is given which can be readily brought into awareness. Finally we also used exercises of recognition and reconstruction of the human figure and body with detached parts. We have seen children, to whom we have given a face to construct, name the different parts of the face though unable to place the elements of the face in their proper places. We have seen such children place one eye in the middle of an empty oval, for example, without realising that the face they had constructed had only one eye and no nose. We have seen others who could put the mouth in its proper place and call out the names of the other parts of the face, but were incapable of building it up. Still others put the two arms or the two legs on one side of the body. They all know that one has two arms and two legs, but they are confused about the exact location.

As graphic tests we have chosen Goodenough's draw-a-man test and Bender's visual motor gestalt test. The Bender test consists of 8 cards, each of which has a design based on gestalt theory. These are presented to the child one at a time, and he is asked to copy each one as exactly as possible. There is no time-limit. Responses depend on several factors: the construction of the design; the ability to perceive the sequence of elements in the design; the time taken to complete each drawing, which varies with the maturity of the subjects; the particular way in which each child goes about copying the design. In a general way the test helps to point out the difficulties that may be caused by visual and motor disorders, and to work out a scale of varying levels of maturity.

In the Goodenough test, the paralysed limbs and parts are often drawn in a more rudimentary way and there is sometimes a sort of projection of muscular sensibility. The tests of segmental positions have shown that the child sees movements of the hand and fingers done slowly but he often imitates only large movements. He cannot dissociate the fingers from the hands; for him the fingers are one with the hand even if they are only lightly affected.

To this disturbance of the body image we may ascribe the difficulties of articulation which some subjects suffering from cortical lesions present. A large number of our patients had some difficulty in carrying out on command, or in reproducing by imitation, the different voluntary movements of the lips and of the tongue which are required in making various sounds. We have therefore added to these tests some exercises allowing us to study in the same subjects mimicry and rhythm.

The rhythm test of Myra Stambach consists of three parts. The first part is spontaneous tempo. The child is given a pencil and is asked to tap with it at regular intervals, following the examiner's example. Any speeding up, slowing down, irregularity, too strong or too weak taps are noted. The second part is copying rhythmic patterns. This consists of 12 different rhythmical arrangements which are done by the examiner and must be copied by the child. Long and short intervals must be tapped distinctly, and the examiner does not go on to the succeeding item until the preceding one has been imitated correctly. The third part concerns comprehension of the symbolism used in these rhythmic patterns and the ability to copy them. The examiner presents a diagram of rhythmic patterns to the child, such as were used in the second part, and the child is asked how these should be tapped. He must be able to interpret the symbols and to distinguish long and short intervals. This third part is very rarely executed by cerebral palsy patients.

We have observed that exercises of mimicry, and especially exercises of "prolonged conscious introspection" which have the character of kinesitherapy of the

muscles of articulation and phonation, followed by resistance exercises for these muscles, strengthen the deficient power of localisation for these groups of muscles and provoke awakening of deep sensibility.

Analogous to these manifestations of the disturbed body image, we have found disturbances in appreciation of rhythm in children with cerebral palsy. They have no sense of time. They do not feel or beat rhythm correctly, in hemiplegics especially on the more affected side. When asked to beat time they do not do so with the more handicapped limb, even if they can move it.

Our patients present in general a gnosic disorientation of their body schema, disorientation in space, and disorders of gesture. These specific difficulties—agnosia and apraxia—do not represent a global intellectual deficiency, but they can lead to failure at school, as we often see in cerebral palsied children, so far as structuration is concerned. They draw or build squares and triangles of uncertain shape, with open or round angles or an upside-down base.

The disturbance of the body image is, of course, a complex matter; it can be related to parietal lesions or to an impairment of the labyrinthine system or of the visual pathways, or to the state of the peripheral motor equipment. We simply want to emphasise that the consciousness of one's own image is deeply tied to proprioceptive sensibility. This image is finally a dynamic one, dealing with movement in surrounding space. This would explain, we believe, the parallelism of syndromes which we meet sometimes in poliomyelitis and cerebral palsy. In poliomyelitics who have been attacked at an early age, deep sensibility has not been awakened or alerted because of the lack of posture and experience. In others, with cortical affections, a disturbed body image is created by the disorders in volition and false transmission.

Therapeutic Exercises

In conclusion, we have worked out a series of therapeutic exercises and have designed apparatus which we use in these exercises.

We have noticed that even the severely affected child orients himself in space in accordance with the position of his body. In this way the child understands the vertical when he has understood "standing", the horizontal when he has learnt "lying", and the oblique when he has learnt "leaning". A child who is aware of his body—who has acquired knowledge of the correct body schema—will understand an angle, square, triangle, and the various shapes and spatial structures necessary to all graphic performance. Finally, posture informs the brain of movement.

It is therefore necessary to apply simple therapeutic exercises for teaching posture awareness, by making the child touch and name the different parts of his body, and here it is joint sensation that is decisive.

We say to a child "Move your elbow," "Move your shoulder," or "your wrist." Why? Because the child understands that it is only this elbow, this shoulder, this wrist which is moving. When one says to him "Lift your arm," it is only the shoulder which moves; we teach the child to dissociate the groups of muscles by making the shoulder work alone, independently of the elbow and wrist, and by pointing it out to him continually.

The healthy child learns about his body by playing with his feet and toes. The handicapped child cannot explore his body as a normal child does. In hemiplegics we find astereognosias due to thalamic or parietal lesions. Sometimes the patient has no knowledge at all of the impaired side of the body, even if the motor impairment is moderate. These patients become accustomed to channel all their motor activity towards the non-affected side.

In this way a partially affected limb is in danger of being totally ignored. The

child suffering from a cortical or neuromotor disturbance will, because of his disordered movement, send a vague, poorly localised and inexact pattern to his brain. Thus the ataxic, being subject to giddiness and disorders of equilibrium owing to the inefficiency of automatic grading of muscle effort, will transmit to his brain a false pattern of postures. We have seen these subjects in the Good-enough test draw a man floating in space. The athetoid, on the other hand, being shaken by uncontrolled movements, will fail to achieve a correct posture because of the exaggerated movements of his limbs.

If the handicapped child is to achieve the exact conveyance of posture patterns to his brain we must make him explore his body thoroughly, as the normal child does instinctively. We must appeal to a tactile and visual approach, whereas a normal child proceeds instinctively and by the stages of normal maturation. First, we make the handicapped child touch the different parts of his body, naming them: "Show your elbow," or "Show your shoulder." We perform exercises with a certain rhythm, both on command and eventually with alternative movements, to establish the memory of movement patterns by constant repetition and by bringing out a more dynamic activity. Next we show him pictures and ask him to indicate on himself the part of the body that we name. In children with neuromotor disturbances of articulation we insist on their exploring all parts of their face, their mouth, and their diaphragm—that is, the organs and parts of the body acting in phonation and articulation. By touching the relevant places, we make them, first, realise the position, and second, feel the movements and tone of the lips and tongue.

Next we proceed to the "Jean-Pierre" exercises. We make the child (a) construct a face from separate elements; and (b) indicate on "Jean-Pierre" (a picture of a boy), or on a sufficiently large picture of a face, the corner of the upper lip, the tongue, etc., and we ask him to make this part move by itself on his own face.

Since spastics, and especially athetoids, often have involuntary movements of the tongue and lips, as well as very powerful contractions of the nostrils, we must get the child into a state of relaxation with the help of the relaxation mask, so that he can dissociate the different groups of muscles necessary for proper articulation. This relaxation is followed by resistance exercises for the bucco-labial region. Before the picture and imitation exercises we start training with "François", an articulated wooden manikin. The child's participation is more active here than in the tactile exploration of his body, for what happens here is a transfer of what the child sees to his own body. Thus the child sees, comprehends on the model, and transposes this to his own body.

Position Games

When the child has reached a certain level of knowledge of his body schema we ask him to carry out postures thoroughly. We call this "position games". We put before the child a picture illustrating some activity—for example, a baby stirring a spoon in a bowl, or a little girl holding a cat in one arm and with the other hand pouring milk into a saucer at her feet for another little cat; or again, pictures in which we see children reading, writing, dressing, or throwing a ball. We put in front of the child at the side of the picture the objects which come into the picture. The child now has, first, to understand what the picture shows; second, to choose the objects used in this scene; third, to take up the same posture.

This process, which is difficult enough, can be prepared for with the aid of exercises done on "François". One can imitate the pictures with this wooden manikin first and the child will imitate the

position games with the manikin because he sees it. Doing it himself is more difficult and requires a better integration of the body image.

This acquisition of gnosic understanding also facilitates re-education in the perceptual disorders of children who have had encephalitis.

As we have noticed, the child with a well-established body image will more easily understand the vertical, oblique and horizontal strokes which are the basis of writing. He will understand the circle, having followed on himself the roundness of his head. A child who has a well-established image of his body will be well orientated for the graphic task he meets at school.

We now start with graded exercises—large movements, small movements, slow movements, fast movements, strong tapping, gentle tapping, etc.—followed by graphic exercises of large vertical and large horizontal strokes.

We make him learn about the middle of his body and the parts extending out from his body, encouraging the perception of his median axis. We also teach him to understand a right-angle made with his body, with his shoulder, his elbow, and his knee, if necessary on the wooden manikin. We get him to appreciate the position by perception exercises. Next we ask the child to take a pencil or chalk and complete an angle by adding the stroke which will make the angle.

All these exercises prepare the child for memorizing shapes and structures, which is generally deficient in children with brain damage. These children see only the details of an object or picture. They cannot integrate the totality made up of the details. They are incapable of synthesis.

Apparatus

The materials used for this body-image training are as follows:

1. "Jean-Pierre"—a picture used in exercises for learning the structure of the face.
2. "François"—a jointed wooden manikin for establishing the body image and different postures of the limbs and trunk.
3. Pictures and cards for imitating posture.
4. Apparatus for exercises for rhythm and gradation.
5. For the disorders of articulation and phonation that are so common in cerebral palsy, a mask is applied as a means of relaxing the muscles of the face, the trapezium and the diaphragm, followed by exercises to encourage the "prise de conscience", as we call introspection or awareness. The work, by awakening sensation, enables the child to make conscious articulatory movements. This is preceded by re-education of the proprioception of the muscle groups acting in articulation and phonation.
6. Position games, to be begun when a child reaches a certain level in knowledge of his body image.

SUSCEPTIBILITY OF BRAIN CELLS

Cerebral palsy is the result of non-progressive damage to the brain in early life. There are many kinds of cerebral palsy, just as there are many ways in which maldevelopment or injury can disturb cerebral function. However, there is not much exact relationship between the varieties of physical and mental handicaps seen and how the brain injuries are produced. The type of cerebral palsy and the degree of handicap are generally related to the anatomical situation of the lesions, and their extent and severity, whatever the noxa has been. Attempts to assign specific causes to the main varieties of cerebral palsy have therefore been discarded in favour of more fundamental investigations into how damaging agents affect brain cells and how brain cells respond to them.

Living tissues may be damaged or destroyed by physical disruption, by lack of essential metabolic substances, or by intoxication. As a rule mechanical injury causes local damage greatest at the site of trauma, although there may be a secondary or consequential reaction. On the other hand, deprivation and intoxication, acting through the circulating blood, will tend to produce widespread damage, either diffuse or scattered, the areas affected depending primarily on the differential vulnerability of the tissues exposed to their injurious action and also on the blood-supply.

The central nervous system is extremely susceptible to this sort of damage. The brain subserves highly specialised functions and has little functional reserve. The body will accept the loss of a kidney or lung with little disturbance, but damage to brain cells is almost always followed by some demonstrable physical or mental handicap. Nerve cells once destroyed cannot be replaced or regenerated. Damage to the brain is, therefore, easily acquired and likely to result in permanent disability. The functional results of damage to the developing brain, in which organised patterns are lacking, seem to be more serious than in the adult.

This vulnerability of the immature nervous system is at some stages of development partly offset by the stronger resistance of its constituent cells to certain forms of injury, notably anoxia and hypoglycæmia. The mechanism of this protection is uncertain, but it seems to involve alternative metabolic pathways less dependent on oxygen than those of the adult cell.

The conditions in early life—prenatal, natal and early postnatal—which may lead to brain injury are legion and complex. Mechanical trauma to the head at delivery is the most obvious cause, but now fortunately an uncommon one. Such injuries produce devastating intracranial bleeding from ruptured blood-vessels. The major injury tends to be localised, but generalised damage will also occur because of the rise in intracranial pressure and the secondary asphyxia accompanying head injuries. A consequence of bleeding is that the areas of brain normally supplied with blood from the torn vessels will be deprived of oxygen and thus may suffer anoxic damage. More occult, but often graver, are the effects of hypoxia and ischæmia on the brain. Any interruption of the umbilical circulation before delivery, or any hindering of

the normal processes of respiration in the newborn infant, will cause hypoxia. Theoretically, this should result in generalised damage to cells in strict accord with their ability to withstand oxygen lack. In the brain the specialised cells of the cerebral cortex are most vulnerable, followed in turn by the globus pallidus, basal ganglia, brain stem, spinal cord and peripheral nerves. The ability to survive periods of hypoxia depends not only on the metabolic needs of the cell but also on the richness of its blood-supply. Cells situated a long way from blood-vessels will be deprived earlier than those close to the source of oxygen. Anoxia alone does not occur often, because of the immediate reactions of the body to lowering of the oxygen supply, and in most cases ischæmia or lack of blood flow also accompanies oxygen lack. Cerebral anoxia rapidly brings about profound circulatory changes. Venous dilatation and cerebral œdema will lead to pressure changes which may constrict or distort the cerebral arteries, with resulting general and local brain damage. Chemical intoxication of the brain is seen in severe neonatal jaundice, when there is an excess of the bile-pigment, bilirubin, in the blood and tissues. In its "indirect" form, this pigment is very soluble in fats and is taken up preferentially by some of the fatty sheathed nerve cells. Once within the cell it paralyses metabolic processes and causes death of the cells concerned, most commonly those of the auditory system or the basal ganglia. However, even these apparently specific syndromes may be complicated by hæmorrhagic or anoxic changes in other parts of the brain.

Enough has been said to indicate that the genesis of cerebral palsy is a complicated matter and there are few simple cause-and-effect relationships. Further research must obviously depend upon teamwork, in which obstetricians, pædiatricians, neurologists, neuro-pathologists, enzymologists and biochemists all have important parts to play.

Thomas E. Oppé.

BOOKS—New and Not So New

RECENT ADVANCES IN CEREBRAL PALSY. Edited by Prof. R. S. Illingworth, M.D., F.R.C.P. with a foreword by Prof. N. B. Capon, M.D., F.R.C.P. *London: J. and A. Churchill,* 1958, *pp.* 389, 50*s.*

As Professor Illingworth says in his preface, "There can be few subjects in the whole of medicine which compare with cerebral palsy for the diversity of problems in so many different disciplines. It is impossible for any one person to be an expert in all its aspects." The fact that so many people with different interests and disciplines are concerned in the management of patients with cerebral palsy makes for peculiar difficulties in compiling a book describing "recent advances". Rather a large number of authors' work must be integrated. Contributors must modify their style so that what they write is intelligible to readers with different interests from their own. Yet many of the advances in their particular speciality are likely to be rather technical and difficult to describe to people less well trained than they are. It is impossible to produce a book of this type all of which would be fully intelligible and equally helpful to occupational, phsyio- and speech therapists, social workers, educationists, pædiatricians, orthopædic surgeons and neurologists. Professor Illingworth is to be congratulated on this bold attempt to do the impossible.

With multiple authorship some unevenness in the quality of the chapters is probably inevitable. The contributions in this book, however, seem to vary more widely than they need both in the soundness of what they say and in the way they say it. There is one outstanding, thought-provoking and comprehensive contribution—that of Russell Meyers on *Recent Advances in Neurosurgery.* Several others are exactly what one hopes to find in a book of this kind; for example, those on *Orthopædic Surgery,* on *Intelligence Testing and Educational Aspects,* on *Statutory and Voluntary Services,* and on *Equipment.* Most of the other contributions must be more or less severely criticised, and one—that on *Speech Therapy* should not, in its present form, have found its way into this book.

Professor Illingworth contributes three chapters—on *Classification, Incidence and Causation,* on *Early Diagnosis and Differential Diagnosis,* and on the *Handicaps of the Child with Cerebral Palsy.* They may conveniently be considered together, as representing an account of recent pædiatric advances.

Professor Illingworth does not reveal what conditions are included in the definition of "cerebral palsy", and which are excluded. Apart from a passing reference in the preface he makes no mention of any definition of cerebral palsy. This would have mattered less if his contributors clearly had a common idea about

what they were writing. He favours "a simple classification which is widely accepted and which is almost the same as that suggested by the American Academy of Cerebral Palsy". In fact he omits its "Atonic", "Mixed" and "Unclassified" types from his categories, does not say why, and does not define his terms. It is not enough, for example, to describe the category of "Athetosis" as "Athetoid movements with a flexor plantar response and normal tendon-jerks" without describing what is understood by the words athetoid or athetosis. Now, when so much attention is being paid to terminology and definitions in the United States and Europe, some discussion of current views would have been welcome. A definition of terms would certainly have helped some of his contributors, though even Professor Illingworth refers to "Hemplegia", "Triplegia" and "Tetraplegia" as if they were major categories (*e.g.* pp. 8 and 9).

In discussing the *Incidence of Different Types* (perhaps *Prevalence* would have been a better word) a clear distinction should have been made between regional surveys, such as that of Hansen in Denmark (which is not mentioned) and surveys reported from clinics and hospitals where the population is more highly selected.

The difficulties of research into ætiology are well described, but the discussion of actual causes is disappointing. The author's reading has obviously been extensive, but one really wants more from him than an annotated bibliography such as is found on pp. 6 and 7. There should have been much more discussion of the relative importance of single and combined ætiological factors in each type of cerebral palsy. Some expansion of this chapter would have been worth while. If only to avoid the unhelpfulness and lack of clarity of the paragraph *Congenital Anomalies* at the top of p. 12 which in its entirety is:

"*Congenital Anomalies.* These include hydrocephalus, cerebral angioma with port-wine nævus on the face (leading to the so-called Sturge-Weber syndrome) and other vascular anomalies leading to the postnatal development of hemiplegia."

The difficulties of early diagnosis and the value of detailed history-taking are excellently discussed in chapter 3, though a fuller account of the types of developmental history obtaining in the various types of cerebral palsy would have been rewarding. The section on examination is, frankly, inadequate. It is always interesting to read about other clinicians' methods of examination, but one expects more in a book of this kind than a description of personal experience. Though the methods described by Gesell are mentioned, the very important techniques of André Thomas and his colleagues are ignored.

It is difficult to gain any clear overall picture of the clinical findings to be expected in each form of cerebral palsy at early stages of its development. Whether or not one attempts to group them into "Stages of Development", there are typical clinical features in many choreoathetoid patients before their typical choreoathetoid movements appear. For example, the tendency to involuntary mass movement of the trunks and limbs in infancy, and the later wild incoordination of any voluntary movement attempted, without any tremor, are characteristic. Taken together with the other neurological findings of these "stages", they enable a reasonably confident diagnosis of "dyskinesia" if not "choreoathetosis" to be made in most cases before the age of one year.

The beautiful account of the early stages of hemiplegia in childhood by Byers surely deserves a place here. Professor Illingworth's comparison between the diplegic baby with hypotonia and the newborn child without head control is valid, as is that between the dystonic attack and the extensor phase of the Moro reflex. Similar comparisons may be made between the stages marking matur-

ation of neuromuscular function in the younger normal child and the other stages of development in most patients with diplegia. Perhaps the collaboration of an American or French pædiatric neurologist would have been helpful in this chapter.

Most of what is contained in *Handicaps of the Child with Cerebral Palsy* is also discussed in other contributions, and the other material which is not would probably have been better integrated into them. As it is the other handicaps are not really adequately discussed in the small space available in this chapter. For example, though we are given a full account of the prevalence of convulsions in the various forms of cerebral palsy, it is hardly adequate to describe them as follows: "The types of convulsions are varied. The commonest variety is probably the major motor convulsions. Akinetic seizures (myoclonic seizures, salaam spasms) are common in the severely defective types. Jacksonian fits are relatively common. Petit mal and psychomotor attacks may also be seen." They should either have been described more fully or not discussed at all. The fact that anticonvulsive treatment is discussed in later contributions should have been mentioned.

Structural Changes in the Brain in Cerebral Palsy are described by Cyril Courville. As one would expect, all the common pathological conditions are well described and many of them are illustrated by good photographs. The descriptions of macroscopic pathology would be useful for any general pathologist wanting to obtain some information about the common findings in cerebral palsy. From the clinician's point of view the chapter is less satisfactory, for he is interested in the alterations of brain structure likely to result from the action of particular damaging agents, or in the pathological findings likely to underlie the various clinical syndromes of cerebral palsy. This information is difficult to dig out of the chapter as it stands. Perhaps some rearrangement by which pathological changes were grouped sequentially under the heading of the ætiological factor most commonly responsible for them would have been more suitable. This arrangement would follow the pattern the same author adopted so successfully in *Contributions to the Study of Cerebral Anoxia.*

The section on *Diagnosis and Educational Treatment of Deafness in Cerebral Palsy,* by A. W. G. Ewing, is largely a review of his own large experience. He amply demonstrates the need for skilled audiometry in all patients with cerebral palsy at the earliest possible age. His illustrative cases are particularly well described and informative. Yet one could have wished that the problems of deciding the best methods of speech training and education for children with cerebral palsy and hearing defects had been discussed further in a general way. When should a hearing-aid be used? When is lip-reading the only practical method of training? What educational and therapeutic provision would the author like to see established for children with hearing defects and cerebral palsy? These questions receive no answer. Could the editor not have asked them?

The chapter by Norah Gibbs, *Psychological Aspects of Cerebral Palsy,* is unfortunately titled. What she discusses are largely psychiatric and social problems—the adjustment of the child and young adult patient to his home, school and more remote environment. Her experience of the problems encountered by patients with cerebral palsy appears to be great, her insight profound. It is a pity that some of her most valuable remarks are partly concealed in somewhat cloudy verbiage.

The style of F. Eleanor Schonell, who writes the chapters on *Intelligence Testing* and *Educational Problems and Methods of Teaching,* is in marked contrast. It is

direct and precise. Her contributions are models of concise clarity. Her discussion of the uses and limitations of psychometric tests leave few questions unanswered. Though references are given to where these may be found, one would have appreciated more detailed descriptions of how the visual, auditory and spatial perceptive difficulties that she mentions affect children's reading, writing and arithmetical performance. Her views on the education of children with cerebral palsy are practical. One can only hope that her remarks about the teaching of mentally subnormal children (p.169) are as widely read as they deserve. In present conditions in this country there is far too much emphasis on education for education's sake. Children who lack the mental capacity to read with pleasure, but who can enjoy television to the full, are laboriously taught elementary reading in an attempt to "broaden their outlook".

H. M. Cohen contributes a most useful, detailed and well-written review of *Statutory and Voluntary Services* in Britain. This meets a real need, though it is unfortunate that he pays so much attention to the facilities offered by voluntary organisations and so little to those of statutory authorities.

It would be interesting and revealing to compare the proportions of cerebral palsied children being educated in schools with normal children and in those for mentally and physically handicapped pupils. One has a suspicion that remarkably few "recent advances" in the provision of schools and vocational centres for children and young adults with cerebral palsy are due to statutory, central or local authorities. Dr. Cohen very clearly indicates the major need for vocational guidance and employment for the adolescent and young adult with cerebral palsy.

Alexander Innes' chapter on *Equipment for the Home, School and Treatment Clinic* includes useful descriptions of many pieces of educational and therapeutic apparatus from different centres. Many of them are well illustrated and should add to the value of the chapter by indicating the design of apparatus used in one centre to the staff of another. The benefits of an electric over a mechanical typewriter for selected patients might have been mentioned.

The chapter on drug therapy by M. A. Perlstein is disappointing. He reviews the uses of a large number of drugs used in the treatment of cerebral palsy and discusses their therapeutic effects in a dogmatic manner. The indications for their use and the clinical effects hoped for are not always clearly stated. For example, though the dangerous drug strychnine is recommended for "hypotonia of central origin", no other indications are given as to when it should be prescribed. In a book of this type it may be permissible to state dogmatically that a drug is or is not useful in cerebral palsy without setting out the evidence on which this opinion is based, but we should surely be given references to where such evidence may be found. This contribution reminds one of the manufacturers' handouts.

In the short chapter on *The Role of Physical Therapy in Cerebral Palsy*, Winthrop M. Phelps presents a careful survey of current "methods" of physical therapy, with selected references to the relevant literature. His descriptions of the various "methods" are more concerned with theories and underlying principles than with the techniques employed. One wonders if expansion of this chapter to allow for some description and evaluation of techniques would not have been more worth while than the discussion of theory. It might also have allowed for an extended discussion of Phelps' own methods of calipering, which one had hoped to see after observing the chapter's title. *Some* authors are too modest! Incidentally, most psychologists would not agree with

the use of the word "conditioning" in this chapter.

The chapter by Ina K. Noton and Suzanne M. Vincent, on *Speech Therapy, Treatment by Relaxation*, describes the principles and (in considerable detail) the practice of the authors. There is no description of the practice of other speech-therapists nor is there any description of the various types of speech defects encountered in cerebral palsy. No indications are given as to which speech disorders require treatment and which may be expected to improve as the child matures. More particularly, the authors do not say which speech disorders may be expected to respond to the "treatment by relaxation" they describe. Diagnosis is not the speech-therapist's strong point, but at least some selection of cases might have been indicated in this chapter. The authors are right to stress the relationship between the motor patterns used in feeding and the patterns useds in the early forms of voluntary vocalisation. They also seem to appreciate that speech is often retarded in development rather than defective in cerebral palsy. These are hardly "recent advances" to most speech-therapists. The theory underlying the methods they practice seems poorly supported by either clinical observation or neurological theory. Their remark, "When the law of reciprocal innervation is normally employed, it is an easy thing to be able to speak, but when this natural control is absent, as in the case of cerebral palsy, lack of speech or a form of speech is a stigma not easily endured", is hard to understand, though it suggests that the authors have confidence.

It is a relief to come to the full review of *Orthopædic Surgery in the Treatment of Cerebral Palsy* by G. A. Pollock and W. J. W. Sharrard, a clearly written and wide-ranging review of current practice in their speciality, with full references to the relevant literature. Their account of the principles and limitations of orthopædic surgery is admirably clear. However, much of the discussion of individual operations could only be properly criticised by another orthopædic surgeon as well acquainted with the surgical problems of cerebral palsy as the authors. It would be difficult to find one in this country. The authors' optimistic opinion on the operative treatment of spastic dislocation of the hip is not generally held by orthopædic surgeons. Some preventive measures might have been mentioned. For example, do the authors approve of standing the patients in full-length calipers when valgus deformity of the hips is marked, as suggested by Phelps? It was surprising to see no reference to severe sensory loss in a hemiplegic upper limb being a contraindication to surgery. The figures given, indicating the proportion of successful and unsuccessful results to be anticipated from specific operations in large series of cases, adds to the value of this review, and it incidentally provides an excuse to raise the problem of the basis on which the results of treatment in cerebral palsy should be assessed. On general principles a surgeon or therapist appears to be the least well fitted person to judge the results of their therapy. Therapists confuse the results of their protracted treatments with the beneficial effects of maturation. Surgeons confuse the fears of patients that another operation may be necessary with satisfaction with the last one, and cosmetic results with functional. Results can probably best be assessed by obtaining a detailed account of the way the child's adaptation to his environment has been altered by treatment, with the help of a social worker and occupational therapist. Could not space have been found for some discussion of the difficulties of assessing results of treatment?

In spite of the defects in some of its chapters, this book provides a most useful review of many current problems in cerebral palsy. One cannot help specul-

ating (rather nastily) on what alterations the contributors would have made in their own chapters if they had been able to read the others first. But the many divergencies of opinion from chapter to chapter are in themselves an indication of where current problems lie.

The book is beautifully produced, clearly printed on good paper, well illustrated, and sits well in the hand. Its cost is relatively high, but one would gladly pay it for the bibliographies alone.

T. T. S. INGRAM.

SAUVEGARDE DE L'ENFANCE. Nos. 1—4, 1957. *Paris*: U.N.A.R.*. *pp.* 644, 800*f.*

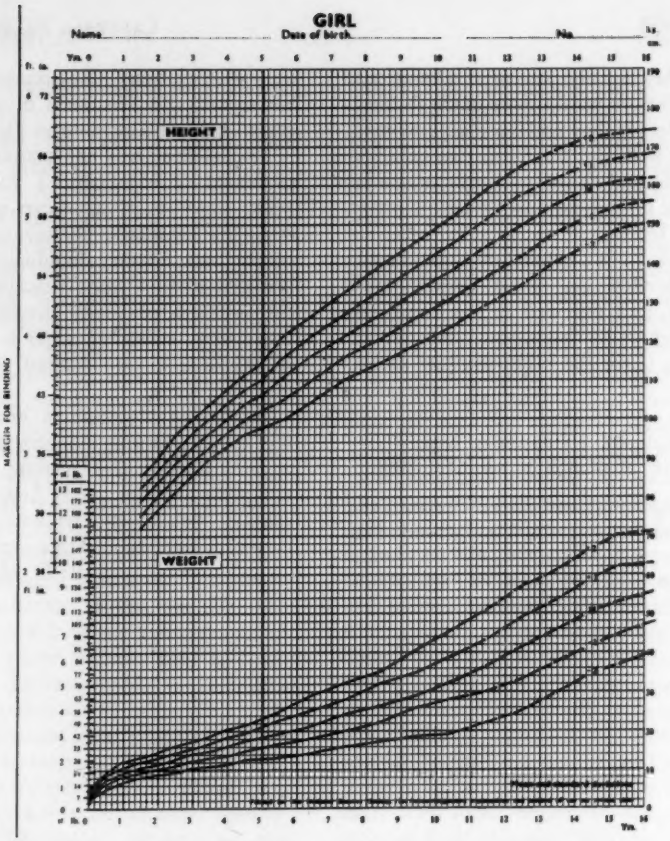
This large combined number reports the VIIIth Congress of the Union Nationale des Associations Regionales pour la Sauvegarde de l'Enfance et de l'Adolescence, held at Toulouse in October, 1956.

The subject was the training and employment of handicapped young people. Many varieties of handicap are considered: low intellect, behaviour disorder, motor and sensory handicaps. Dr. Guy Tardieu gives a very valuable review of the problem of young people with cerebral palsy, including what is being done in the U.S.A. and United Kingdom, as well as France.

Increasing attention is being given to the subject in this country too; there is a great deal in this volume to help and stimulate school and factory medical officers, youth employment officers, and the voluntary organisations in this country.

R. C. MAC KEITH.

*From: U.N.A.R. 28, Place St. Georges, Paris 9ième.



HEIGHT AND WEIGHT CHARTS FOR BOYS AND GIRLS

Height and weight charts for boys and girls, based on British observations, have not hitherto been available in this country. The charts illustrated here about half scale, covering the period from birth to 16 years, were drawn from data obtained from the Oxford Child Health Survey and the L.C.C. report on heights and weights in London, by permission of the Oxford Social Medicine Unit and the L.C.C. Public Health Department. They were prepared so that units and schools for cerebral palsied children might have standard height and weight charts on which to plot figures obtained at various intervals and observe the progress of the children in their care. It was decided to make them available also to pædiatric units, school medical officers, and others who might wish to use them.

The charts show separately the height and weight curves representing the mean and the values of 1 and 2 standard deviations above and below the mean. The legend on their back gives details of their construction, explains the significance of the curves, and describes how the children should be weighed and measured. The charts were constructed at the suggestion of the Medical Advisory Committee of the National Spastics Society.

Separate charts for boys and girls, measuring 9 in. by 11¼ in., can be obtained from the N.S.S. Research Unit, Keats House, Guy's Hospital, London, S.E.1, at a (subsidised) price of 1½d. each, plus postage. Equal numbers of boys' and girls' charts will be sent unless otherwise specified.

PAUL E. POLANI, M.D., M.R.C.P.

ABSTRACTS

IN COLLABORATION WITH *"Abstracts of World Medicine,"* PUBLISHED BY THE BRITISH MEDICAL ASSOCIATION

The Relationship of Little's Disease to Premature Birth

J. A. CHURCHILL. *A.M.A. Journal of Diseases of Children.* July, 1958, **96,** 32-39, 5 figs., 20 refs.

In an attempt to relate the manifestations of Little's disease to premature birth the authors studied, at the Henry Ford Hospital, Detroit, a series of 530 patients, aged 2 to 20 years, whose birth weight was known and who were suffering from such disorders as cerebral palsy, epilepsy, and mental deficiency. These patients were divided into 2 main groups: Group D (diplegia) consisted of 76 patients with a combination of bilateral Babinsky signs, hyperactivity of deep tendon reflexes, increased (or decreased) muscle tonus, reduced movement of the trunk and extremities, and a history of late onset of walking. The remaining 454 patients (Group O: others) had symptoms of epilepsy, mental deficiency, or hemiplegia but were without the syndrome manifested by Group D. Group D was subdivided into 2 classes, (i) simple spastic, and (ii) complex diplegia, this latter subgroup including all with one or more of the following: convulsions (15 cases), mental deficiency (36), athetosis (5), tonic neck reaction (11), asymmetry of functioning of extremities (7), greater impairment of upper than lower extremities (19), and hypotonus (10).

The mean birth weight of the 454 patients in Group O was 3,245 g., whereas for the 76 patients in Group D it was 2,392 g., being 1,662 g. for the simple spastic sub group and 2,983 g. for the complex diplegia subgroup; this latter figure is not significantly less than that for Group O. It is further noted that abnormalities of delivery were known to have occurred in 22 of the 42 cases in the complex diplegia subgroup, whereas in the 34 cases in the simple spastic group there were only 8 known abnormal deliveries. The significance of this definite relationship demonstrated between the simple spastic type of Little's disease and low birth weight is discussed.

E. H. Johnson

Methocarbamol—New Agent in Treatment of Neurological and Neuromuscular Diseases

D. S. O'DOHERTY and C. D. SHIELDS. *Journal of the American Medical Association.* May 10, 1958, **167,** 160-163, 13 refs.

In the search for a more effective drug for reducing spasticity, rigidity, and muscle spasm in patients with neuromuscular diseases the authors have carried out, at Georgetown University Medical Centre, Washington, D.C., a trial of methocarbamol (3-*o*-methoxyphenoxy-2-hydroxypropyl-1-carbamate), which was given in a dosage of 1 to 4 g. daily in divided doses to 70 patients with skeletal muscle hyperactivity secondary to neurological disorders. There was no improvement in patients with spasticity, rigidity, contractures, and chronic fibromyositis, but a good result was obtained in 18 out of 25 patients with acute muscle spasm. Some improvement was also observed in patients with muscular incoordination. The relaxing effect of methocarbamol is believed to be due to its depression of spinal multisynaptic pathways, with no effect on monosynaptic reflexes, which would explain its helpful action in patients with cerebellar signs.

I. Ansell

Methocarbamol (Robaxin) in Orthopædic Conditions. Preliminary Report of One Hundred Cases

H. F. FORSYTH. *Journal of the American Medical Association.* May 10, 1958, **167,** 163-168, 3 refs.

In a trial reported from the Bowman Gray School of Medicine, Wake Forest College, Winston-Salem, North Carolina, methocarbamol in a dosage of 6 g. daily in divided doses was given to 100 patients suffering from painful orthopædic conditions. Of 58 acute cases in the series, including 39 cases of herniated disk, 11 of muscular or ligamentous strain, 3 of torticollis, and 5 of muscle injuries, there was a moderate to pronounced beneficial effect in most, the relief of muscle spasm enabling the patients to become ambulant sooner, generally with less need to resort to narcotics. There was also some improvement in cases of more chronic conditions, such as spondylitis, myositis, fibrositis, and night leg-cramps. A group of postoperative patients also benefited, while in a small group of miscellaneous cases the intravenous infusion of 500 mg. of methocarbamol, 2.5% in saline, relieved spasm within a minute, enabling the reduction of dislocated shoulder and the manipulation of spastic flat foot to be carried out without anæthesia.

Side-effects, which occurred in about 10% of the patients, included drowsiness or nausea, which disappeared in 3 cases on reduction of dosage. There was also an allergic type of skin reaction in 2 patients.

I. Ansell

Clinical Results with Methocarbamol, a New Interneuronal Blocking Agent
H. W. PARK. *Journal of the American Medical Association*. May 10, 1958, **167**, 168-172, 2 refs.

The effect of treatment with methocarbamol ("robaxin") was evaluated at the Medical College of Virginia, Richmond, Virginia, in 42 patients with involuntary increase in muscle tone. A signficant clinical response occurred in 10 out of 11 patients with residual spasticity due to spinal cord injury, although in all of the 3 patients with complete lesions the severe spasticity and involuntary movements returned when medication was discontinued; however, the 7 patients with partial cord damage retained improved functional ability and suppression of mass reflex patterns after methocarbamol was stopped. There was also a significant response in 4 patients with residual spasticity due to encephalomyelopathy, 5 with residual spastic hemiplegia following a cerebrovascular accident, 2 with disseminated sclerosis, and 3 with acute myalgia. A significant reduction of spasticity was noted in 3 out of 5 cases of cerebral palsy of spastic type, but there was no change in 2 cases of the athetoid type. No benefit was observed in 10 patients with chronic arthritic and myalgic disorders.

The average dose of the drug was 2 g. orally 4 times daily. Side-effects included drowsiness, difficulty in concentration, and blurred vision, suggesting that methocarbamol has "a secondary supraspinal focus of action". In all but 2 cases the side-effects were reversed by reducing the dosage. No side-effects developed after 72 hours of medication.

I. Ansell

Ataxia-telangiectasia. A Familial Syndrome of Progressive Cerebellar Ataxia, Oculocutaneous Telangiectasia and Frequent Pulmonary Infection
E. BODER and R. P. SEDGWICK. *Pediatrics*. April, 1958, **21**, 526-554. 8 figs., 23 refs.

The authors describe, from the Cedars of Lebanon and the Children's Hospitals, Los Angeles, 8 cases of a syndrome in children for which they have proposed the name ataxia-telangiectasia, and of which the main features are progressive ataxia of cerebellar type beginning in infancy, marked telangiectasis of the bulbar conjunctivæ and butterfly area of the face, susceptibility to sinopulmonary infection, including bronchiectasis, peculiarity of the eye movements simulating ophthalmoplegia, and a strong familial incidence. Spontaneous athetoid movements, intention tremor, and hypotonia may also be present, while the tendon reflexes may be reduced or absent. By 11 years of age the ataxia and rapid fatigability usually make the use of a wheeled chair necessary. The cutaneous pigmentation may resemble freckles, and the conjunctival telangiectasis is typically angular and predominantly horizontal. The telangiectasis usually appears after the ataxia, generally between the ages of 4 to 6 years. A constant feature is the slow initiation of movements of the eyes, halting midway on lateral and upward gaze, with rapid blinking and coarse nystagmoid oscillations on return to forward gaze. Speech is slow, slurred, and scanning. Breath control is poor, and drooling, a dull, sad, inattentive facial expression, and a stooping posture with the head usually tilted to one side complete the picture. The patient's disposition is equable and intelligence is within normal range. In 6 of the authors' cases the height and weight were below average and the hair and skin tended to be dry and coarse.

Before the onset of the telangiectasis, diagnoses of ataxia, athetoid or spastic cerebral palsy, and cerebellar dysgenesis or agenesis were made in several of the cases. Cerebellar atrophy was revealed by pneumoencephalography, and necropsy (performed in one case) showed progressive, diffuse, cortical cerebellar degeneration with enlarged venules in the cerebellar leptomeninges and white matter. The authors suggest that ataxia-telangiectasia is a fifth entity in the phakomatoses.

G. de M. Rudolf

Flexion Spasm in Infancy. A Clinical Study of 36 Cases
S. THIEFFRY and J. AICARDI. *Semaine des hôpitaux de Paris*. April 24, 1958, **34**, 1167-1178, 3 figs., 40 refs.

The authors report from the Hôpital des Enfants-Malades, Paris, a clinical and electroencephalographic study of 36 cases of the syndrome of flexion spasm in early infancy. The complete syndrome consists in: (1) myoclonic spasms accompanied by anterior flexion of the body axis (*tic de salaam*) which occur with great frequency, are very resistant to anticonvulsant treatment, and are often preceded, accompanied, or followed by spasms of other types; (2) marked intellectual deterioration, involving particularly a loss of interest in the surroundings, which is often, but not always, associated with permanent neurological disturbance; and (3) a disorganized electroencephalogram without obvious basic rhythm, the recording consisting almost entirely of slow waves of very large amplitude, interrupted by generalized paroxysmal sharp points without rhythmic organization affecting the whole of the tracing. The prognosis in regard to mental development is extremely poor, in contrast to that in the many cases with only slight disturbance of movement. Dissociated forms were also seen in which the clinical symptomatology was similar, but without the mental deterioration.

The authors believe they can distinguish two types of the syndrome, these depending on whether psychomotor development was or was not normal before the appearance of the spasms. In cases of the former type the stereotyped development is stressed and the authors

suggest this type represents a true syndrome. They also critically review the present ideas concerning the ætiology of the condition and express the view that previous theories regarding the role of encephalitis, obstetrical trauma, hæmolytic disease of the newborn, toxoplasmosis, multiple malformations, and Tay-Sach's disease in its causation do not adequately explain the syndrome. They stress the finding of heredo-degenerative factors in their own cases and the association of specific metabolic disturbances in analogous cases reported in the literature.

R. Wyburn-Mason

Some Observations on the Congenital Deformity of the Central Nervous System Known as the Arnold-Chiari Malformation

P. M. DANIEL and S. J. STRICH. *Journal of Neuropathology and Experimental Neurology*. April, 1958, **17**, 255-266. 14 figs. 20 refs.

In this paper from the Radcliffe Infirmary, Oxford, the authors describe the findings in 26 cases of the fully developed Arnold-Chiari malformation, especially some additional features which, they consider, have hitherto been overlooked. The main features of the malformation are a displacement of a tongue of cerebellar tissue derived from the vermis, together with the medulla, downwards through the foramen magnum into the spinal canal. In all 26 cases there was an associated myelomeningocele. Other features were a curious "beaked" appearance of the tectal plate, similar to that seen in an embryo of approximately 50 mm. crown-rump length, and the presence of choroid plexus on the dorsal surface and around the sides of the cerebellar tail. It is suggested that these malformations originate very early in embryonic life, and that failure of the formation of the pontine flexure may account for the elongation of the brain stem. In the Arnold-Chiari malformation the structure of the posterior cranial fossa frequently shows associated abnormality. The fossa is usually small and the tentorium attached close to the foramen magnum. It is pointed out that owing to the downward displacement of the medulla, cisternal puncture in infants with myelomeningocele is potentially very dangerous.

R. G. Rushworth

Further Studies on Intelligence Levels in Cerebral Palsied Children

L. B. HOHMAN and D. K. FREEDHEIM. *American Journal of Physical Medicine*. April, 1958, **37**, 90-97. 6 figs., 5 refs.

Testing of 1,003 children with cerebral palsy between the ages of 7 months and 16 years shows that mental retardation is tragically frequent in cerebral palsied children. The number of CP's who are truly educable for any economic independence is probably much less than 40%; because from the 40% which have IQ's above 70 there must be subtracted a number of cases whose physical handicaps are sufficiently severe to prevent a useful or usable education. The problem of many of the severe CP's is finding adequate custodial care when they are incapable of independent living—[Authors' summary.]

Tranquillizers in Mental Deficiency: Chlorpromazine

M. CRAFT. *Journal of Mental Deficiency Research*. Dec., 1957, **1**, 91-95. 8 refs.

Low-grade mental defectives present a serious nursing problem since they are destructive, aggressive, noisy, and dirty. This paper reports a clinical trial of chlorpromazine carried out at the Royal Western Counties Institution, Starcross, Devon, on 16 (11 male and 5 female) high-grade idiots with an I.Q. below 30, who were unable to frame sentences, wash, dress, or protect themselves against dangers. Their aggressiveness, activity, and social behaviour were rated daily by the nursing staff before and during the experimental period which was divided into two parts. In the first part the patients received either chlorpromazine or amylobarbitone sodium in identical tablets, the order of administration of which was then reversed in the second part of the experiment. The dosage of either drug was gradually increased unless side-effects appeared; these, it was later found, were all due to chlorpromazine and consisted in photophobia, light sensitization, drowsiness, Parkinsonism, and frenzied outbursts. The initial dose of chlorpromazine was 50 mg. daily. In 3 cases this dose could be increased to 800 mg. daily, but the majority of the patients could not tolerate more than 400 to 600 mg. daily, and in 2 cases the drug had to be withdrawn because of severe side-effects. The daily dose of amylobarbitone sodium was ½ grain (32 mg.) initially, gradually increased to 8 grains (0.5 g.) daily; it produced no side-effects.

A statistical analysis of variance carried out on the daily behaviour ratings showed that significant differences in activity and social behaviour, but not in aggression, were obtained in the three observation periods. But these differences were apparently not matched by clinical progress, the nursing staff failing to see any improvement in their patients. Chlorpromazine did not alter the activity or aggressiveness of the patients. It had a slightly beneficial effect on social behaviour which, however, remained far below that considered socially acceptable. It was concluded that chlorpromazine has no value in the treatment of hyperactive high-grade idiots, and may even be detrimental because of its side-effects.

F. K. Taylor

Dissociation as a Guide to Developmental Assessment

R. S. ILLINGWORTH. *Archives of Disease in Childhood*. April, 1958, **33**, 118-122. 3 refs.

In assessing the development of an infant or young child one should always note the relationship of one milestone of development to another, in order to assess the rate of development and the relationship of milestones in one field of development to those in another. Not infrequently development in one field is out of step with that in another. This might be termed dissociation. The reasons for this imbalance are discussed.

Isolated delay in motor development may occur without apparent reason, so that the child grows up to be perfectly normal. More often it results from a physical disability, in particular hypotonia or hypertonia. It never signifies mental deficiency. Relative advancement in motor development in relation to other fields occasionally occurs in mentally defective children. Unusual and isolated advancement in motor development does not mean 'superior intelligence.

Retardation in social behaviour is of considerable prognostic significance, implying a poor prognosis for intelligence. The degree of retardation in a child with retardation in other fields is of great importance: only slight social retardation with severe motor retardation may occur in the presence of a severe mechanical disability, such as cerebral palsy, with an only slightly lowered intelligence. Advanced social development is a good index of superior intelligence, except that it is difficult to assess in figures.

Isolated delay in speech frequently occurs in children of normal or superior intelligence, and never means mental deficiency. Only moderate retardation in speech in the presence of severe retardation in other fields (as in cerebral palsy) excludes severe mental deficiency. Isolated advancement in speech is a good sign of superior intelligence.

Isolated delay in sphincter control is commonly associated with mismanagement or with familial factors, and is of no importance in developmental assessment. Advancement, relative or absolute, is of little value because of the difficulty in assessing its significance (i.e. whether the control is really voluntary and not mere conditioning). Delay in chewing may result from mismanagement and otherwise does not occur alone.—[Author's summary.]

Congenital Malformations of the Central Nervous System in Scotland

J. H. EDWARDS. *British Journal of Preventive and Social Medicine*. July, 1958, **12**, 115-130. 10 figs., 15 refs.

In 1956 neonatal mortality from congenital malformations in England and Wales was still 91% of what it was a quarter of a century ago. In Scotland (but not in England and Wales) since 1939 the notification of stillbirth has had to include a statement of the probable cause, and from the returns of the Registrar-General for Scotland, Record and McKeown (*Brit. J. soc. Med.*, 1949, **3**, 183) showed that congenital malformations accounted for 9% of infant deaths and 16% of stillbirths in that country during the period 1939-45. The same authors, using data from the City of Birmingham Maternity and Child Welfare Departments and adopting locality of domicile, rent of house, and legitimacy of birth as indices of social status, were unable to demonstrate any social class gradient in the incidence of congenital malformations of the central nervous system.

Since 1950 data on social class in cases of stillbirth have been available for Scotland, and the present report is based on these and other data for the years 1950-56. Crude stillbirth rates for the three principal malformations of the central nervous system (anencephalus, spina bifida, and hydrocephalus) in the five social classes showed a steep gradient from 2.1 per 1,000 total births in Social Class I to 5.5 per 1,000 in Social Class V. [In 1956 the gradient for all types of congenital malformation was from 2.1 per 1,000 total births in Social Class I to 6.2 per 1,000 in Social Class V. Deaths from congenital malformations of the nervous system accounted for 85% of a total of 472.] Unfortunately, the tabulation of the data in the national statistics is not sufficiently detailed to permit comparison of rates for the different social classes when standardized for parity and maternal age, so that it is not possible to determine how much of the social class gradient is due to these factors. It is shown, however, that all three types of malformation were more common in first than in second births, and there was some evidence that in anencephalus this increased risk "may be in part due to a distinct condition, with a lower sex-ratio, to which spring and summer conceptions of primiparae are peculiarly but erratically predisposed".

The maternal age groups in which the risk of these conditions appeared to be at a minimum were 25 to 29 years for anencephalus, 20 to 24 years for hydrocephalus, and under 20 years for spina bifida. At subsequent ages the risk increased, but it is possible that this merely reflects an association with parity. In the absence of a tabulation of stillbirths by both these factors in the national statistics no definite conclusion can be drawn. There was some evidence that in illegitimate pregnancies resulting in stillbirths anencephalus is relatively infrequent. Examination of the regional variation in the rate of stillbirth due to these causes shows that areas with a high incidence of one of the three conditions tended to have a similarly high incidence of both of the others. The rates for spina bifida were considerably higher in urban than in rural areas, but there was no such excess incidence of the other two malformations in the towns. The incidence of anencephalus in the winter months was about 30% higher than in the summer, whereas no seasonal trend could be demonstrated for the other two types.

The author speculates on the possible importance of such environmental factors as

infection, malnutrition, chemical poisons, alcohol, tobacco, preservatives, dyes, foodstuff improvers, hormones, mechanical trauma, radiation trauma, and foetal anoxia in determining secular variations in the rate of stillbirth due to nervous malformations. With reference to improvers in foodstuffs, the intriguing suggestion is put forward that "an aversion to foods processed on an industrial scale and a relative conservatism towards some modern farming techniques are possible reasons for the relatively low incidence of anencephalus on the European continent compared with that in such relatively well-fed regions as Great Britain and Rhode Island".

[The author's reputation is sufficiently high to guarantee the statistical validity of his conclusions. But he has adopted such a condensed style of writing that at several points the abstracter at least was unable to follow the chain of the argument.] *E. Lewis-Faning*

Clinical Signs of Neonatal Tetany: with Especial Reference to Their Occurrence in Newborn Babies of Diabetic Mothers

W. S. CRAIG. *Pediatrics.* Aug., 1958, **22,** 297-308. 37 refs.

The clinical and biochemical findings in 7 infants with neonatal tetany are described in this paper from the Department of Pædiatrics and Child Health, University of Leeds. All 7 infants were born prematurely, 6 of them to diabetic mothers and one to a woman with a prediabetic type of glucose-tolerance curve. Symptoms of tetany appeared within 24 hours after birth and were associated with a low serum calcium concentration. The full clinical picture developed in three stages, the first being associated with respiratory difficulty, the second with progressive neuromuscular instability and hyper-excitability, and the third with periods of severe agitation, muscular tremors, extreme tachypnoea, and cyanosis. These clinical disturbances were severe in five infants and mild in 2; all the infants recovered completely. The serum calcium level, which was lower in the 5 infants with severe tetany than in the remaining 2, rose gradually to normal during the first week of life, spontaneously in 3 infants and after calcium therapy in 4. There were no significant changes in the serum levels of ultrafilterable calcium, phosphorus, and alkaline phosphatase, or in the blood sugar and blood urea concentrations.

The differential diagnosis of neonatal tetany from hyaline membrane, hypoglycaemia, intracranial birth injury, and intracranial infection such as meningitis is discussed. The author considers that both diabetes and prematurity are contributory aetiological factors in neonatal hypocalcaemic tetany, the former possibly through adreno-pituitary dysfunction resulting in hormonal disturbance, and the latter by accentuating the hypocalacemia normally occurring soon after birth.

He briefly describes a series of 38 infants born of diabetic mothers over a period of several years preceding the present study, in whom the blood chemistry was not investigated but in 15 the clinical picture closely resembled that of mild hypocalcaemic tetany. He also refers in an addendum to 6 further infants born of diabetic mothers, 4 of whom had clinical tetany with a serum calcium level of 8.0 mg. per 100 ml. or less. *Gerald Sandler*

An Epidemiologic Study of Behaviour Characteristics in Children

R. LAPOUSE and M. A. MONK. *American Journal of Public Health.* Sept., 1958, **48,** 1134-1144.

This paper from the University of Buffalo School of Medicine, New York, gives a preliminary account of an experiment designed to discover the variations of normal childhood behaviour. The method and scope of the experiment are described and a partial analysis of the findings presented.

The population studied consisted of 482 children between the ages of 6 and 12 years, these subjects being selected by visiting every 75th address listed in the Buffalo City Directory. Of the families living at these addresses and containing children of the appropriate age, 94% agreed to cooperate. Only one child was selected from each family, but where there was more than one child between 6 and 12 the information obtained was suitably weighted. Interviewers went to the homes armed with a schedule of 200 questions designed to survey the child's behaviour and to gather information about the household. The informant in each case was the mother or mother-substitute. Reliability and validity tests were carried out by re-interviewing a proportion of the mothers and by cross-checking some of the information given by subsequently questioning the child. It was found that the mothers were accurate with regard to objective and clearly defined phenomena, whereas the children tended to exaggerate some unimportant aspects of their behaviour and to conceal others, such as bed-wetting, of which they were ashamed. Other possible sources of error, such as bias on the part of the interviewer or in the framing of questions, were studied and their importance is discussed.

The potential value of the experiment is illustrated by the authors' findings for "tension phenomena" such as nail-biting, nose-picking, lip-sucking, teeth-grinding, and thumb-sucking. About 30% of the children were reported to show one of these behaviour traits, 20% two, and 16% three or more. It is pointed out that this high incidence raises the question whether these traits, which are commonly considered to be indicative of a psychiatric disorder, should not more properly be regarded as transient variations of normal behaviour.

[This investigation is a valuable attempt to introduce scientific accuracy into a field hitherto mainly ruled by clinical impressions.]
J. Rendle-Short

The subscription to this Bulletin is 12s. a year (including postage), payable to the Secretary, National Spastics Society, 28 Fitzroy Square, London, W.1.

Correspondence should be addressed to the Editorial Board at 28 Fitzroy Square, London, W.1, or to the Editor at 29 Hadlow Road, Tonbridge, Kent.